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ABSTRACT

This study compared preservice teachers' beliefs (taken from journal reflections) about inquiry before, during, and after their field placement experiences. The subjects of the study were preservice students (n=48) enrolled in an elementary science methods course at a large midwestern university during the spring semester of 2001. Most of the students' background in science consisted of an introductory course in physics, in chemistry, and in biology. Their science lessons were structured according to the 5E learning cycle (Bybee, Buchwald, Crissman, Hell, Kuerbis, Matsumoto, and McInerney, 1989). This study documents how preservice students can improve their understanding of inquiry, but stops short of determining whether understanding becomes future practice for these future teachers. (Contains 19 references.) (MVL)

If Inquiry Is So Great, Why Isn't Everyone Doing It?

by
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IF INQUIRY IS SO GREAT, WHY ISN'T EVERYONE DOING IT?

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The educational adage that teachers tend to teach the way they were taught can be either positive or negative depending on the nature of the teaching they have experienced. Traditionally, science has been taught in a manner in which students passively listen to teachers lecture or read and answer questions from a textbook (Weiss, 1987). Many science teachers end up teaching this way because they were not modeled other methods of teaching (Bryan & Abell, 1999). One method of teaching science that has gained considerable ground in the past ten years is the use of inquiry to make science a more hands on and minds on endeavor. Even though the idea of teaching inquiry has been around since the early 1900's (DeBoer, 1991), implementing inquiry into the classroom has proven to be a challenging task for teachers at all levels.

Pre-service teachers generally experience scientific inquiry for the first time in their science methods courses in college (NSTA Reports, 1996). The problem persists that if pre-service teachers have never been exposed to inquiry then they may be uncertain how to teach using this method (Stake & Easley, 1978). Lee, Krapfl, & Steffen (2000) conclude from Fosnot (1989) that teachers are a product of an "educational system where they have acquired twelve to thirteen years of passive listening and regurgitation followed by more years of post-secondary school refining these skills" (p. 635). If this is the case then it is unrealistic to expect pre-service teachers to know how to teach inquiry based on one science methods course taken in undergraduate school.

Pre-service teachers may have a conception of how students learn based on their own experiences (Mellado, 1998). If these experiences have been negative then teachers

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may perpetuate negative connotations of science or, worse, they may decide against teaching science altogether. In order to break the cycle of traditional teaching, teachers will have to experience learning in the way they want their students to learn (Loucks-Horsley & Stiegelbauer, 1991). Teachers must be able to think in a different manner than the way they were taught (Broko & Putnam, 1995). If pre-service teachers tend to teach the way they were taught then science educators should be prepared to model inquiry.

Methodology

The subjects of this study were pre-service students enrolled in an elementary science methods course (n=48) at a large Mid-western university during the spring semester of 2001. The group of junior level students comprised of 43 females and five males. Most of the pre-service teachers' background in science consisted of an introductory course in physics, in chemistry, and in biology. This elementary science methods course is the only science methods course required of pre-service elementary teachers. A field placement experience accompanies this course.

As part of the early field experience, pre-service teachers spend one day a week for four weeks teaching science to elementary students. Pre-service teachers spend three hours during each visit to the school in which 40 minutes is allotted for science lessons. Several pre-service teachers are assigned to the same classroom and teach groups of four-five elementary students. Their science lessons were structured according to the 5E learning cycle (for information on the 5E learning cycle refer to Bybee, Buchwald, Crissman, Hell, Kuerbis, Matsumoto, & McInerney, 1989), which stretched over one day a week for four weeks.

This study compared pre-service teachers' beliefs about inquiry before, during, and after their field placement experiences. One of the expectations of their science field experience is that they will use an inquiry-based methodology to teach a science lesson. This is consistent with the National Science Education Standards, which states, "Teachers of science plan an inquiry-based science program for their students" (NRC, 1996, p. 30).

As the instructor of this elementary science methods course, the pre-service teachers had been exposed to inquiry-based methods during their elementary science methods class in which they were concurrently enrolled. This introduction to inquiry consisted of discussions about question and answer techniques, ways to engage students, how to help students conduct investigations and explain their findings, ways to relate the lesson to everyday life as well as strategies for assessing students by using journals, portfolios, rubrics, and discussions. The instructor and the class discussed ways to make lessons more inquiry-based but we did not formulate a definition of inquiry.

The main purpose of assessing their conceptual understanding of inquiry is so I would be able to see how they were constructing the pieces of their inquiry puzzle. I wanted to know what they believed about inquiry and how they defined inquiry. Authentic assessments in the form of reflections revealed how pre-service teachers conceptualized inquiry and the kinds of activities/questions they believed constituted inquiry.

The first reflection occurred after discussions about inquiry strategies but before their first field experience. In this reflection, teachers described their concerns and perceptions of inquiry. Over a period of four weeks during their field placement experiences, pre-service teachers reflected on their teaching experience, paying careful

attention to identifying instances of inquiry. At the end of four weeks, pre-service teachers compared how their definition of inquiry had changed over their four-week experience. Their conceptions of scientific inquiry at the beginning, during, and after their field experience provided insight into how they defined inquiry and how they viewed inquiry taking place in the classroom. I looked for patterns in their journal responses concerning students' conceptions of inquiry as they progressed in their teaching using this unfamiliar method.

In summary, pre-service teachers reflected on a definition of inquiry before their field placement experience. In the second reflection, pre-service teachers provided instances of inquiry occurring in the classroom. In the final reflection, pre-service teachers compared how their definition of scientific inquiry had changed over the course of their teaching. All three reflections consisted of journal entries.

Results

Prior to field placement experience

Initially, many of the students felt scared and nervous about teaching scientific inquiry because they had never experienced this method as a learner. Pre-service teachers expressed fears about teaching an approach that few used, and one that most had not experienced.

The question of inquiry is not an easy one. My lack of experience coupled with my limited exposure has left me questioning the entire method.

In their reflections, students speculated on reasons why practicing teachers adhered to traditional ways of teaching. Some pre-service teachers described inquiry as time consuming and difficult to teach because the teacher has to leave everything up to

chance. Practicing teachers may lack confidence in the subject matter and may also feel they will lose control of the classroom.

Most pre-service teachers had not experienced inquiry methods during their schooling. Their first exposure to scientific inquiry was the elementary science methods class in which they were concurrently enrolled. This lack of inquiry modeling is evident by their reflections.

I did not have much experience with inquiry throughout my schooling. I know most of my science classes in junior high and high school consisted of looking up a definition and answers to questions.

When defining inquiry, pre-service teachers focused on the role of the teacher in the inquiry process. Most students described the role of the teacher as a guide or a facilitator. Pre-service teachers did not describe what the teacher actually did in these roles but later reflections revealed that they were initially confused about what the teacher was supposed to do as a facilitator.

Several pre-service teachers mentioned how the teacher should create an environment where students feel comfortable asking each other questions without running to the teacher to find the answer. If students rely on teachers for the answers then they will think there is only one right answer when there could be several explanations. Because students are not told exactly what to do, they discuss possible answers with classmates and refer to resources. Teachers should not give students the "right" answers but rather help them find the answers themselves. The students can develop their answers through cooperative learning.

Many pre-service teachers felt students gained leadership skills, independence, and a sense of ownership by relying on resources other than the teacher. In this learning

environment, students look to one another for information. Students who know where to look for the answers to questions develop skills for lifelong learning. These pre-service teachers recognized the importance of helping students to become scientifically literate.

We inquire when we do not know the answer. We choose to investigate until we get the answer or an understanding of the issue using a variety of resources. Students will continue to enjoy learning later in life. Lessons with clear, straightforward instructions do not let a student imagine and grow; they just learn to listen.

The collection of responses on conceptions of inquiry is much richer than any definition I would have given them. Below is a compilation of excerpts from the reflections of twelve students. Together these provide a rich insight into the meaning of inquiry.

Inquiry is a "live" approach to teaching if you will. Teachers who use inquiry don't necessarily know what questions their students will have, or what ideas they will want to test. The inquiry method is not something that you can Xerox or check with an answer key. What I like best about the inquiry method is that it requires teachers to learn along with their students. Inquiry is a way of teaching science where we relate what is being taught to actual occurrences in the world around us. I have come to believe that inquiry is the process of trying things out, asking questions, and learning from personal curiosity. Inquiry-based learning involves fewer concepts, but more in depth coverage of those concepts. Students decide what sparks their interest and use that spark to light a fire. In inquiry, the students structure the class with their questions rather than the teacher leading the class with answers. Teachers encourage students to expand on their ideas. Inquiry allows students to do experiments without knowing the outcomes prior to beginning. Students have more freedom to participate and take ownership of their learning. Students are given the opportunity to apply their knowledge with inquiry because they are expected to investigate in a way that makes sense to them rather than to the teacher. The entire point of inquiry is to find out something you did not know.

Inquiry touches many aspects of the classroom- the role of the teacher, the level of student participation, how a science investigation is conducted, the skills students develop that can be applied outside of the classroom, the arrangement of materials and the room, how students interact with each other and the teacher, and how students learn.

During field placement experience

Students provided many instances of inquiry moments during their field placement experiences. Though some of these experiences may not be considered inquiry by some, it is important to highlight the types of activities pre-service teachers considered inquiry-based. Simply providing a definition of inquiry does not capture the nature of inquiry; these examples put inquiry into a meaningful context.

Soon all of the children were jumping on their ice to make it smaller. It was great to see their minds working. When one idea didn't work, they deduced how to solve the problem in an even better way, which is the true meaning of inquiry. All in all though, it was a nice activity, which got children thinking and problem solving, which are two main goals of science inquiry.

Pre-service teachers expressed surprise at students' ingenuity when students were given freedom to express themselves. I could have just told my pre-service teachers how inquiry encourages creativity but for them to see it for themselves proved very rewarding for them.

I knew right off the bat that inquiry was taking place because students were asking themselves and others questions about what they were going to construct. Each student had an idea to add, and the products being created were absolutely magnificent. It was so neat to see the students work together so well, and to hear one exclaim, "Hey, I've got an idea!" I knew that kids were creative, but I was blown away by this much creativity and imagination. The explanations for the work of the machines ranged from a trash-collecting machine to a lightning catcher. The kids explained every detail down to how the machine would come packaged if purchased. I thought it was neat how students in the audience had ideas for the students presenting.

Pre-service teachers grappled with the amount of independence to give their students while working on projects. They discovered that teachers have to constantly monitor the students to figure out when to step in to clarify or redirect the class.

I was afraid to show them how the pulleys worked because I feared they would not come up with different ideas on their own. But after I saw the frustration in

their eyes, I brought them all together and showed them how the pulleys worked. I learned that you do not have to leave out instructions or explanations to make inquiry occur. The students must have enough background to work by themselves.

In another classroom, the pre-service teacher monitored the classroom and decided the students did not need additional explanations. The teacher could take a step back and let the students continue. Each classroom may be different in the amount of direction the students need to successfully complete investigations.

I could tell that inquiry was taking place because I did not offer them explanations; instead, I allowed them to answer their own questions and make their own comments about the objects. They reached conclusions on their own, which was amazing for me to see.

Not only did students benefit from inquiry methods but pre-service teachers learned along with their students. At times, teachers reflected how initially they did not know the answer to a question but when the class explored the question, the students and the teacher marveled at their discoveries.

We were looking at whether things floated or sunk [sic] and we were trying out different objects like paperclips, rocks, corks. One student was noticing a pencil, which had been sharpened so many times that the pencil was very short. He asked if he could put this object into the water. I figured the pencil would float. I mean it is wood and all but to my excitement, and to his, the pencil stood vertically.

After field placement experience

Several pre-service teachers confessed during their final reflection that they were more skeptical about teaching inquiry than they had let on in their first reflection. During their first reflection, perhaps they were uncertain what to fear and, thus, had difficulty pinpointing the sources of discomfort. The realization of their apprehension to teach inquiry to their renewed interest in understanding inquiry allowed them to see their growth.

At first I was a little leery about this method. I was confused. I did not understand how this could be successful learning for the students. To be honest, I thought the whole process was a waste of time and in no way would it work for these kids. But after experiencing it for the first time, I saw inquiry in a different light. They shouldn't expect the teachers to spell out everything to them. It seems more beneficial to the students when they learn things on their own, through questioning and exploring methods. I like how students are allowed to have independence while they are learning.

They also held misconceptions of inquiry that were not easily identified in the first reflection. Pre-service teachers confessed that they thought inquiry was completely student-based or rather student run.

I am happy to write this reflection because I have had a change of heart about inquiry-based teaching and learning. When the idea was first presented, I, like many others in our class, was very confused and scared of inquiry. I thought that inquiry was completely student centered and consisted of a teacher turning her students loose with random materials that they would hopefully learn from. But, as I began to write my own unit and as we completed more activities and experiences in class, my definition of inquiry began to change.

Before entering this lesson, I felt that inquiry was something completely arbitrary with no clear guidelines or lessons. I was afraid of inquiry because I felt that I would have no control over the students and what they were doing in the classroom. I was afraid of what might happen to the structure of my classroom if I attempted to teach my students through an inquiry-based method. Now that I have faced these fears, I can honestly say that I have learned a great deal about inquiry and am not afraid of using it in my classroom.

Misconceptions about who had control in the classroom led to confusion about the role of the teacher. If the teacher is supposed to be a guide, what does the guide do? Some pre-service teachers adjusted their definition of inquiry to include the changing role of a teacher during the inquiry process. While students still described the role of the teacher as a facilitator or guide, they also expanded the role to that of mediator, consultant, and coach.

In the example of making slime, the kids came up with specific questions and tests that they could perform in order to see what the substance was. In an activity like this, the teacher is the facilitator. I was there for guidance and to help them

figure out where they wanted to go with their experiments. At the end, I was a mediator as the kids shared their information. I think kids will need lots of simple inquiry activities to prepare them for doing large inquiry lessons.

Another misconception that surfaced in the final reflection was that inquiry was too time consuming and difficult. After teaching inquiry, some pre-service teachers described how the preparation for an inquiry lesson is extensive but once the plans are made, the students become active participants in their learning by asking questions, experimenting, researching, communicating with peers, and drawing conclusions. Once the pre-service teachers saw how the students assumed an active role in their learning, they could see that though inquiry may require more time in preparation and structuring the lesson, the teachers took a step back and let the students generate ideas, discuss options, make decisions, choose materials, generate results, and share new findings.

My definition of inquiry no longer includes tons of hard work devoted to the entire unit. After using this method, I have seen that the hard work on my behalf only involves writing the lesson.

Because students share a greater responsibility in their learning, several pre-service teachers discussed how students also gained self-confidence by being able to solve problems on their own.

The main point of inquiry-based learning is that children are responsible for some part of the learning on their own. They must learn from an early age how to find things out for themselves. If we give the students this key then they will be much better learners in their futures. By doing this early, when they are older they will know where to look when they need an answer and will not feel like learning is impossible. This is a key that we can give children and we should give them to better their futures.

Inquiry is a key to unlocking knowledge. The skills children develop through inquiry help them access information that they might not have been able to. If the teacher or the textbook is always providing children with information and never teaching them

the skills to find the answers then children are limited by what is presented to them. They may not know how to open the door to expand their thinking.

Through these reflections, pre-service teachers described their conceptions of inquiry and provided examples of inquiry experiences. The most notable difference in conceptions of scientific inquiry over the four-week period was not that their definition of scientific inquiry changed but that their attitude toward teaching it had. Many stated that instead of changing their definition of inquiry, their definition expanded, became clearer, or held deeper meaning for them.

Throughout this unit, my definition of inquiry has not necessarily changed, but my attitude towards it for sure has. Initially, I was nervous about inquiry-based activities. It was and probably will be hard to take a step back and let students figure things out on their own, rather than just telling them the answer, but that has become easier for me. All in all, I feel much more comfortable using inquiry-based activities in my classroom and actually plan on trying to use the method a lot. I like the way students are teaching themselves in a way, because it will help them remember things better and also to become interested to pursue future learning.

My definition hasn't necessarily changed, but it has expanded to a more meaningful definition. So my definition of inquiry is that children need to grow knowledgeable through using previous knowledge, asking/answering questions, exploring or self-discovery, sharing ideas, and communication. This is all in my previous understanding of inquiry, but actually doing it compared to only reading/hearing about it, has given me a clearer understanding of the importance and effectiveness it has.

Perhaps one of the most indicative responses that let me know their inquiry lessons had been successful was when a student wrote, "I wonder if other teachers know about inquiry. If they did, they probably would use it." These are testimonials of pre-service teachers; many who had never heard of inquiry much less experienced its use as learners themselves.

Discussion

In the first reflections pre-service teachers described being nervous and scared to teach inquiry. By their final reflections, some confessed that before they had taught using inquiry, they initially felt inquiry was a waste of time and questioned the effectiveness of this method. When I first presented inquiry to the pre-service teachers, I expected them to be nervous about teaching. What I didn't expect to see revealed was the resistance pre-service teachers felt toward teaching this seemingly new approach. They questioned the usefulness of inquiry and how it could be used to enhance science learning. I am glad I didn't tell them inquiry had been around for 100 years already without wide acceptance.

I should have expected my pre-service teachers to go through a period of "disequilibrium" because they were in the process of constructing new models of teaching and trying to fit them into their educational schema (Piaget, 1975). Christopher Day (1999, p. 55) cautions that "teachers who are reflective inquirers need to recognize that inquiry is likely to raise issues of change and that will involve a confrontation of inconsistencies with/in and between existing core values." What need to be in place are support structures for teachers whose previous conceptions of teaching have crumbled.

The results of this research support Rankin's identification of common inquiry misconceptions (2000). Though some of the misconceptions Rankin addresses were not reflected in this study, other misconceptions not identified by Rankin surfaced. These misconceptions included the amount of time involved in preparing inquiry based lessons and the notion of a disparity between the scientific method and inquiry. This study provides a research basis for some of Rankin's assertions about inquiry misconceptions.

Some of my students were so convinced by the success of their inquiry experience that they stated they would use inquiry all the time. Rankin reminds educators that in the push for more inquiry based activities that other educational methodologies should not fall by the wayside. Teachers should be equipped with the knowledge to make decisions about which methods fit certain concepts or objectives.

One misconception that Rankin identified, which I did not account for during my teaching of inquiry to pre-service teachers, is that "all hands-on is not inquiry; not all inquiry is hands on" (p. 34). I believe some of pre-service teachers still believe this misconception because I did not highlight other ways to do inquiry. In class, we mainly focused on how activities could be more "hands on" rather than discussing how the process of finding an answer through research could also be considered inquiry.

In further support of Rankin's identification of misconceptions, my pre-service teachers also had misconceptions about questions having multiple answers. Many of them had experienced in science class only right or wrong answers. As they facilitated inquiry investigations with their students, they began to see how questions could have multiple answers. Students could take different approaches to problems that resulted in multiple outcomes.

Rankin has also encountered the misconception that inquiry teaching is chaotic. In fact, inquiry teaching involves a "high level of organization, planning, and structure" (p. 36). Students didn't realize some of their misconceptions until after they had experienced inquiry and had gotten a sense of how inquiry worked. Initially, pre-service teachers felt the teacher relinquished control of the class and let the "students take charge of their learning." This is a common phrase used to describe the students' role in an

inquiry classroom. However, to a teacher who is unfamiliar with inquiry, this sounds as if the teacher is not in charge.

In addition to Rankin's description of inquiry misconceptions, pre-service teachers' reflections also indicated others. In their first reflections, some pre-service teachers expressed concern over how much time was involved in inquiry lessons, and that inquiry required a lot more time and effort than other strategies. Some pre-service teachers even described the time commitment as a factor for why practicing teaching did not use inquiry. During their final reflections, pre-service teachers realized that inquiry requires more effort initially to prepare the lesson but once the teacher had sparked students' interests and helped them get started, the students were the ones asking many of the questions and carrying out the investigations.

Another misconception I identified in some of their reflections is the notion that the scientific method does not include inquiry. One student described inquiry as, "I am learning a new approach to teaching science outside of the scientific method." From my explanation of inquiry, I had somewhere given the impression that inquiry was incongruous to the scientific method when, in fact, the scientific method can be a tool used to carry out inquiry investigations (Reiff et. al, submitted).

Implications

This study documents how pre-service students can improve their understanding of inquiry, but stops short of determining whether understanding becomes future practice for these future teachers. Hewson, Tabachnick, Zeichner, & Lemberger (1999) discuss that in order for a conceptual change to occur, an extended period of time is needed for

students to make sense of their experiences. Even if standards mandate inquiry-based programs, teachers cannot be expected to change their beliefs or practices overnight.

A single science methods course that emphasizes inquiry is insufficient to make a lasting impact on teaching practices. Although classroom teachers as well as faculty members may recognize the importance of teaching inquiry, they may not know how to make such changes. Teachers at all levels should be supported while making the transition from more traditional methods to inquiry-based methods. Marilyn Zaretsky (quoted in Staten, 1998, p. 1) ascertains, "What we want from our students, we must give to our teachers first." As educators, we have a responsibility to prepare future teachers to teach in accordance to the standards. The problem remains on how to expect pre-service teachers to implement a method or concept that is not clearly defined.

Some teachers may think they are teaching inquiry when they really are not. This is a problem that will continue to exist as long as inquiry is loosely defined. Hardy (1998) considers that inquiry is the only teaching strategy that gives students a chance to explore the processes of science. Hardy further notes that under the "banner of inquiry, a lot of teachers do a lot of traditional teaching" (p. 28). This statement stresses the importance of asking teachers to construct their own definitions of inquiry then to look for examples of inquiry in their teaching.

Presenting inquiry through modeling or having pre-service teachers read about inquiry is not the same as a reflective process in which they move from defining inquiry to deriving a meaning for inquiry. Reflections are a way for pre-service teachers to figure out how they think and feel about inquiry, to identify instances of inquiry during their teaching, and to measure how much they have changed in their thinking. If I had

assigned one reflection either at the beginning or the end of their teaching experience, pre-service teachers would not have had a reference point for how they initially felt about inquiry. This process helped them to see for themselves how much their definition of inquiry had expanded and had developed a deeper meaning.

Originally, I considered the reflections as a way to assess their understanding of inquiry but the reflections soon became a tool for pre-service teachers to see how far they had come in their thinking of inquiry. The reflections also provided me with evaluations of my presentation of inquiry to pre-service teachers. Some of the misconceptions that surfaced were ones I had not considered but ones that I will try to address in the future. I will also expect pre-service teachers to initially resist inquiry because of their lack of experience but I am more convinced now than ever the value of experiencing and reflecting on inquiry.

Future pre-service teachers can also benefit from reading the reflections of former pre-service teachers. They will be able to see how their peers articulate inquiry and some of the confusion and apprehension of teaching this unfamiliar method. Perhaps reading how others define inquiry can help future teachers see the process of understanding inquiry and how it works.

The title of this paper was inspired by one of my elementary science methods students who asked, "If inquiry is so great why isn't everyone doing it?" She had a valid point. Recently, schools of education are stressing the need to use inquiry-based teaching methods; yet, many of the teachers our students observed are not using these methods. In-service cooperating teachers rarely use inquiry-based methods in their classrooms nor do their college-level science instructors. Without good models that pre-service teachers

can observe and experience, methods instructors alone cannot be expected to successfully inculcate students with these techniques. Inquiry cannot be learned from a textbook or from a single methods course. Pre-service teachers must be given time to assess the teaching methods they experienced in school, to evaluate additional teaching methodologies, to practice using a variety of teaching approaches, and to reflect on the effectiveness of each method. Inquiry has to make sense to teachers so they will use it because they want to not because the standards mandate inquiry teaching.

The following are some suggestions for teaching pre-service teachers inquiry:

1. Have a field experience in place for them to practice inquiry techniques.
2. Model inquiry practices. Show different levels of inquiry from a more structured approach to one that is more open ended (Colburn, 2000).
3. Expect students to question the effectiveness of inquiry.
4. Use reflections to identify misconceptions and to deepen their understanding of inquiry.
5. Discuss during class their inquiry teaching experiences.
6. Help students realize a wide variety of instructional methods. Compare inquiry to these methods. Inquiry does not have to be used all the time.

The National Science Foundation (1996) reports that "...few teachers, particularly those at the elementary level experience any college science teaching that stresses skills of inquiry and investigation, they simply never learn to use these methods of teaching" (NSTA Reports, p. 11). If teachers receive training that is traditional then they are more likely to continue the cycle of textbook oriented science. Forms of reflection such as how pre-service teachers define inquiry, how they incorporate inquiry into their teaching, and

how their conception of scientific inquiry changes after teaching inquiry is essential to supporting pre-service teachers in their transition to inquiry-based teaching. Instances such as these, filled with real life experiences, provide a deeper understanding of how inquiry is incorporated into teaching practices and put into action.

Conclusion

This paper selected journal reflections from 48 pre-service elementary teachers who reflected on the meaning of scientific inquiry before, during, and after their field placement experiences. In the science education department, we were expecting students to teach inquiry yet many of their teachers in elementary and secondary schools did not use this method and neither did their college professors. Teacher educators cannot expect students to learn how to teach inquiry by having taken one methods course that discusses inquiry. Inquiry is not easily defined and, so, cannot be learned from a textbook.

Examining pre-service teachers' conceptions of inquiry has allowed me to identify misconceptions about inquiry. If teachers are expected to teach inquiry then it is important to develop a common conception of inquiry. Since inquiry has been loosely defined in many contexts, helping to define inquiry can be a pivotal step in actually asking teachers to teach a method with which educators are familiar.

The importance of revealing pre-service teachers' conceptions of inquiry provides valuable insight into how pre-service teachers make the transition from seeing a science lesson that is prescribed to a lesson where students and even the teacher develop a sense of wonderment. The nature of inquiry is active because in order to understand inquiry, one actually needs to *do* inquiry.

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